Drink. Water Eng. Sci. Discuss.,
doi:10.5194/dwes-2017-12-RC1, 2017


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Drinking Water
Engineering and Science
Discussions

# *Interactive comment on* "Inclusion of Tank Configurations as a Variable in the Cost Optimization of Branched Piped Water Networks" *by* Nikhil Hooda and Om Damani

**Anonymous Referee #1**

Received and published: 27 March 2017

This paper discusses how to include tank configurations in the design optimization of gravity-fed branched water distribution pipe networks. The optimization formulation used to include tank configurations, i.e. Integer Linear Programming, the fact that the developed tool (JalTantra) is made freely available online and GIS functionality is included in the system are all very interesting.

However, the paper has some logical problems regarding the purpose of tanks and the trade-off between pipe and tank costs, which undermine the significance of the developed tool for practical applications.

1. The authors say, "the purpose of using tanks is to divide the network into a primary network and secondary network" (Page 1, Line 28). This is not true. The primary



purpose of using tanks is to balance the hourly varying demands and to reserve water for emergency, such as during pipe or other system component failure as well as for fire fighting. Therefore, it is not practical to decide tank configurations from the point of view of capital cost alone.

2. In Page 2, Line 2, it is stated as, "Typically the primary network runs for the entire day whereas the secondary networks are scheduled to run for a few hours every day.... Thus flow rate in a secondary network is higher than that in a primary network." The trade-off ("push and pull") between pipe and tank costs is largely based on this assumption, but this is not always true. The assumption that secondary networks are scheduled to run for a few hours every day is only true in a rotational water supply system, which cannot be avoided if there is water scarcity. Otherwise, the pipes in the secondary network should also be full and running always to avoid contamination. In such a case, which is probably the most common, the argument that pipe cost will be highest when there is only one tank and lowest when the entire network is primary (a tank at each node) may not be correct.

In summary, tank configuration is not a serious concern in gravity-fed branched distribution networks as compared to in distribution networks with pumps. In the latter case, tank configuration, which includes number, location, elevation and storage volume of the tanks, should be decided by considering both capital costs and future operation costs of the system as well as system reliability. If the authors can revise their system (JalTantra) to handle optimization of such distribution networks, it will be a significant contribution to the water industry as well as to the scientific community. The authors can get important information from the work of M. Abunada et al. 2014 (paper attached below).

Please also note the supplement to this comment:
http://www.drink-water-eng-sci-discuss.net/dwes-2017-12/dwes-2017-12-RC1-supplement.pdf